Care Pathways: Guidance on Appraising Sustainability

Inpatient Bed Day Module

October 2015

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Working across the NHS, Public Health and Social Care system

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TABLE OF CONTENTS

1	INPATIENT BED DAY	2
1.1	DESCRIPTION	2
1.2	BOUNDARY SETTING	3
1.3	UNIT OF ANALYSIS	8
1.4	ACTIVITY DATA	8
1.5	EMISSION FACTORS	11
1.6	MODULE CALCULATION STEPS	11
1.7	EXAMPLE CALCULATIONS	13

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1 INPATIENT BED DAY

This module provides guidance on how to calculate the performance of a representative patient staying in hospital as an inpatient against the sustainability metrics. It can be used:

- to direct the appraisal of a specific inpatient bed day, through the collection of primary activity data, for a care pathway; or
- as a source of secondary data for inpatient bed days to inform a screening assessment of a care pathway; or
- as a source of secondary data for an appraisal of a care pathway where inpatient bed days are known not to be material to the overall care pathway.

1.1 DESCRIPTION

An inpatient bed day is a 24 hour period over which a patient stays overnight at a hospital for treatment and monitoring. The inpatient admission may be elective or unplanned, and the patient may stay in different wards, depending on their condition and its severity.

Inpatient

An inpatient is a patient who is required to stay at the hospital for testing, treatment or surgery. This is opposed to an outpatient who would return home on the same day as their admission (ie less than 24 hours in hospital). Monitoring, testing and treatment may all be undertaken whilst the inpatient is occupying a bed in a ward. The patient may also be sent to the operating room for a surgical procedure or diagnostics may be performed away from the ward. The patient may receive visitors whilst occupying a bed in a ward. The patient may be moved between different dependency hospital wards or discharged.

An elective admission is a pre-arranged inpatient bed day that is confirmed prior to the patient arriving at a hospital. Typically, this will be confirmed via an admission letter. Some hospitals require patients to have a pre-assessment with a nurse or doctor, either in person or over the phone or via email. They may be required to call the hospital on the day of their appointment to confirm that a bed is available. Non-emergency ambulance or taxi services are provided to those who cannot travel by their own means.

An unplanned admission is a patient entering as an inpatient in an emergency situation, typically via an emergency department or after a GP visit. The patient will require occupancy in a ward suited to the severity of their condition.

Hospital Wards

A patient will require occupancy in a ward providing a level of care that is dependent upon the severity of their condition.

The UK Department of Health has defined levels of care for patients, and these have been adopted for this module [(1)]. These include the following.

- Level 0: patients whose needs can be met through normal ward care in an acute hospital.
- Level 1: patients at risk of their condition deteriorating, or those who have been recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from the critical care team.
- Level 2: patients requiring more detailed observation or intervention, including support for a single failing organ system or post-operative care and those 'stepping down' from higher levels of care.
- Level 3: patients requiring advanced respiratory support alone or basic respiratory support, together with support of at least two organ systems. This level includes all complex patients requiring support for multi-organ failure.

The specific ward type shall be defined for the care pathway being appraised. For example, the levels above can be simplified to the following categories:

- Low dependency bed day: patients categorised as Level 0 and Level 1; and
- High dependency bed day: patients categorised as Level 2 and Level 3.

This categorisation is based upon the provision of care for a patient with one or more failing organs.

1.2 BOUNDARY SETTING

Boundary setting is an important step to ensure consistency with respect to what should and should not be included in the appraisal of a module. When appraising an inpatient bed day, the first step is to map out all of the activities a patient undertakes when using the module. Following this, the services required to provide these activities shall be determined and finally the resources (eg consumables, energy, etc) identified that are required to provide these services.

To ensure consistency in appraisals, recommended activities, services and resources for an inpatient bed day are presented below.

1.2.1 Activities Undertaken to Provide an Inpatient Bed Day

A patient may go through the following steps in completing an inpatient bed day.
(Note: yellow text refers to activities & orange text refers to separate modules to be included in a care pathway)

(1) UK Department of Health, Comprehensive Critical Care: A Review of Adult Critical Care Services, http://webarchive.nationalarchives.gov.uk/20130107105354/http:/www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4082872.pdf

- Admission letter: for elective admissions, an appointment is arranged and a letter is sent out to the patient letting them know the time of their appointment and whether they are required to attend a pre-assessment (note that this may often be deemed immaterial to the module and can be reasonably excluded through conducting a materiality assessment).
- Travel: the patient travels to the hospital either under emergency conditions, for pre-assessment or non-emergency admission (included under patient travel module).
- Pre-assessment: for elective admissions, the patient attends a pre-assessment prior to admission.
- Travel: for pre-assessment prior to admission, the patient travels back home after the pre-assessment and then travels back to the hospital on the day of their inpatient appointment (included under patient travel module).
- Emergency department: for emergency conditions, the patient may enter the hospital via the ED and bypass the typical reception and pre-assessment that is conducted in non-emergency conditions.
- Registration: the patient is admitted as an inpatient.
- Bed Day: the patient is taken to a ward appropriate to their condition and occupies a bed. Patients may move between wards as their condition changes (eg high dependency to low dependency).
- Diagnostic, treatment and surgical procedures: the patient may require additional services provided by the hospital whilst occupying a bed in a ward, including a surgical procedure or diagnostic treatment. These are outside the scope of this module, but shall be included in the care pathway as separate modules.
- Visitors: relatives and friends may visit the patient while they are at hospital.
- Discharge and travel: the patient travels from the hospital after completing their stay (included under patient travel module), is discharged to other services or leaves by other means.

Pre-assessment and registration happens once for each elective inpatient stay. A care pathway may include occupancy in a number of different types of wards, depending on the severity of their condition. The number of 24 hour periods of occupancy in each ward shall be added together to calculate the care pathway specific inpatient bed day module.

Any treatment (including diagnostics and care provided by allied health professions) delivered within the ward shall be included. However, if treatment or diagnostics are undertaken in a different department of the hospital, or by another service, they shall be excluded from this module and be included separately in the care pathway map.

There may be variations to these activities and regional differences shall be accounted for when mapping out a specific inpatient bed day module.

1.2.2 Services & Facilities Required to Provide an Inpatient Bed Day

To provide these activities, the following services and facilities are required.

- Registration area and staff to register the patient.
- Pre-assessment rooms used for the check-ups prior to patient admission.
- Low dependency wards for the patient to stay in during treatment/monitoring (level 0 and level 1).
- High dependency wards for the patient to stay in during treatment/monitoring (level 2 and level 3) should one or more organs fail.
- Catering and laundry services to provide hospitality to the patient via the provision of food and linen. These services may be on-site or contracted out to an external provider.
- Shared services this includes security and porters who move patients and equipment between different departments and wards.
- Administrative services and areas to run the wards within a hospital or other facility.

Any services and facilities associated with a hospital but not required by the wards shall be excluded from this module (eg occupational health clinics). Capital goods (eg buildings, car parks) can be excluded from the module unless they are known to be material (1) to the performance of the module against the sustainability metrics appraised.

A proportion of the hospital shared building, support and administrative services (eg management of records, porter services, cleaning of buildings etc) shall be allocated to the wards in the hospital as described in the Allocation section of this module.

1.2.3 Resources Required to Provide an Inpatient Bed Day

Based on the list of activities, services and facilities identified above, the following categories of activity data shall be included:
(Note: green text refers to data that shall be included in an appraisal of the module)

- Facilities (eg energy, water and waste associated with buildings).
- Consumables (eg pharmaceuticals, single use medical devices).
- Medical gases, eg nitrous oxide.
- Equipment (eg reusable medical equipment, hospital beds, furniture).
- Food and linen (eg patient meals and bedding).
- Travel (eg staff travel, visitor travel).

Additional processes to be included are the cleaning and sterilisation of medical equipment and rooms, and the laundering of employee and patient apparel and bed linen/towels. These are captured by allocating the total energy, water and consumables used and waste generated.

A summary of resources and activities that shall be included in this module is presented below. These may be excluded if they can be shown not to be material to the results. Exclusions should be undertaken by applying the materiality rules in the main document, ie no more than 10% of the total impact may be excluded. A list of additional care pathway modules that may be required to connect to this module in order to develop the overall care pathway map is provided. These additional

(1) Refer to section 2.6.3 Materiality and Data Screening in the Care Pathways: Guidance on Appraising Sustainability: Main Document

modules are included as examples in order to highlight where this module might fit in to the overall care pathway.

Include these activity data:

- Consumables used in registration, pre-assessment and different ward types
- Equipment used in registration, pre-assessment and different ward types
- Equipment and consumables used in shared services
- Electricity, fuel and water use in registration, pre-assessment and different ward types
- Electricity, fuel and water used in shared services
- Food consumption by patient
- Linen use and cleaning
- Staff travel
- Visitor travel
- Waste generated
- Facilities cleaning
- Sterilisation
- Administration activities

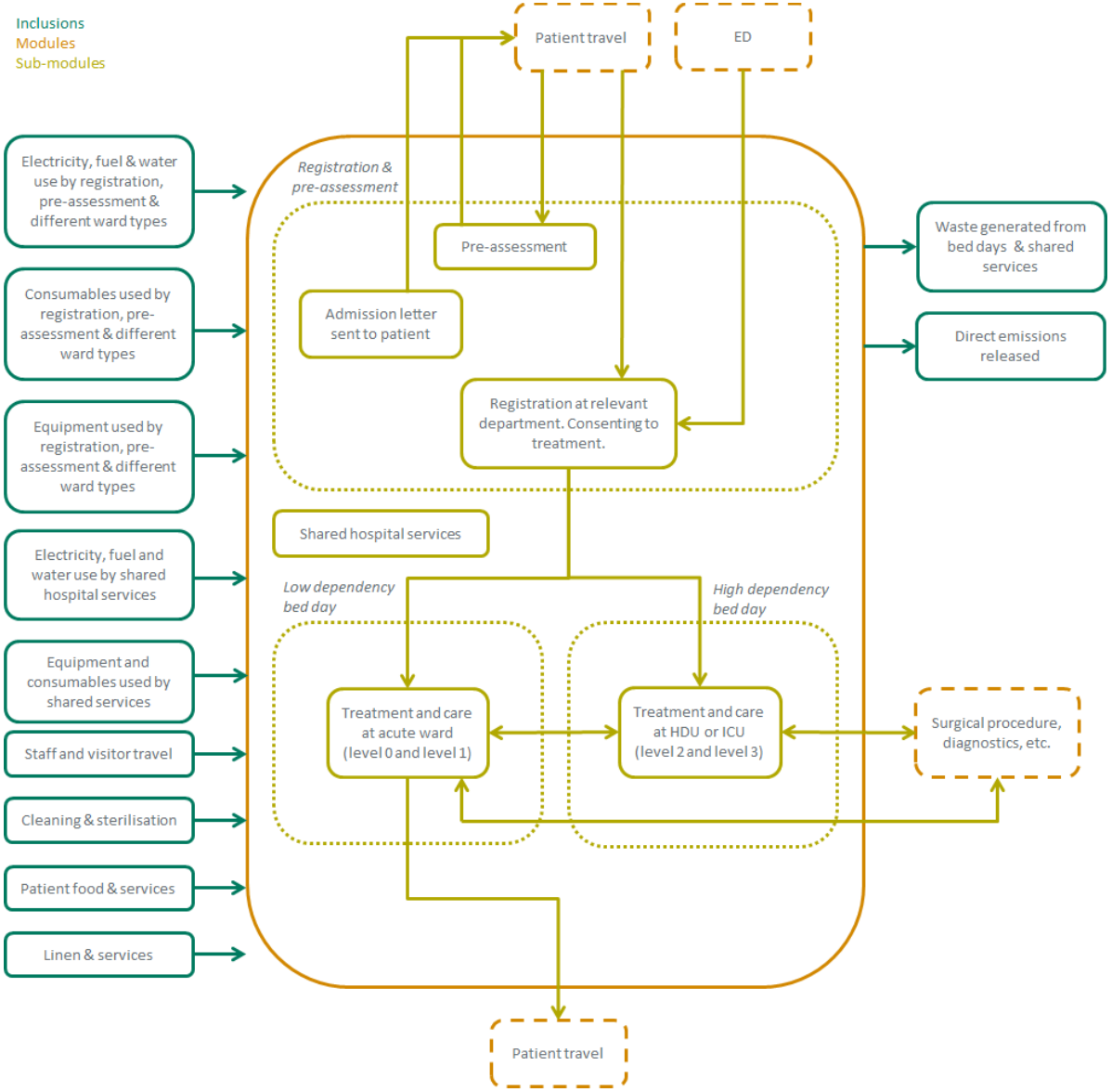
Exclude these activity data:

- Capital goods (eg buildings, car parks)
- Staff training
- Health authorities, financial services
- Staff non- protective clothing and food consumption

Additional modules that may be required, but that are excluded from this module:

- Patient travel
- Surgical procedure
- Other services provided after admission

Figure 1.1 Inpatient Bed Day Example Process Map



1.3 UNIT OF ANALYSIS

A unit of analysis is identified as a common 'reference flow' or 'basis for comparison' to allow for the module to be included in a care pathway appraisal or to be used to compare different scenarios of the same module (eg intensive care units [ICUs] in different regions or the significance of changes made to an existing hospital ward).

A patient in a defined age group, with a specific condition, spending a specific number of bed days at a particular type of hospital ward in a geographical area.

The unit of analysis for this module is a set number of patients, in this case attending hospital overnight as an inpatient (ie staying for +24 hours). This specifically excludes day patients and outpatients who, by definition, would be staying for shorter time periods. It is important to make the magnitude of care clear, including the age and condition of the patient, the intensity of the bed day, as well as the amount of time the patient is expected to stay.

- eg an adult patient, who has had a stroke, staying in a low-intensity (level 0) ward for three bed days in a hospital in the UK.

1.4 ACTIVITY DATA

Activity data are the quantified measures of activity relevant to the module being appraised.

Inpatient bed day module activity data include the following:

- Reference data, such as floor area and throughput of the ward split by services and types of patient.
- Facilities data (eg energy, water and waste) of the ward split by services and patient type where possible.
- Consumables, medical gases and equipment used in each of the activities defined for an Inpatient bed day attributed to patient type and condition where possible.
- Consumable and equipment used in shared services of inpatient administration and the hospital.
- Travel of staff required to provide the inpatient service and all shared hospital services.

Primary activity data shall be collected to appraise the module if they are found to be material to the care pathway.

To determine if primary activity data are required, the data in *Section 1.7* can be used to inform a screening assessment of a care pathway. If the activity is found not to be material in the screening study, primary data, although preferable, are not required and the case study data can be used to represent the inpatient visit within the care pathway.

1.4.1 Primary Data

Where required, primary activity data specific to the inpatient bed day being appraised shall be included. These data are likely to be sourced from a representative sample of hospital wards involved in the appraisal.

If an inpatient bed day for a specific condition is being appraised, data including the following shall be collected to represent a patient with that condition staying in hospital for 24 hours.

- Consumables for the inpatient bed day: the type and quantity of all consumables required to provide treatment in specific type of ward, including those used by allied health professions. These data should be for the specific condition that is being appraised.
- Equipment for the inpatient bed day: the type, quantity, lifetime and number of uses of equipment required to provide treatment in a specific type of ward. These data should be for the specific condition that is being appraised.
- Consumables and equipment used in registration and pre-assessment: the type, quantity, lifetime and number of uses of equipment and type and quantity of consumables required to provide registration and pre-assessment of the patient for treatment within a specific type of ward.
- Facilities for the inpatient bed day: quantity of electricity, fuels, water and types of waste generated from the inpatient bed day for the specific condition. If possible, these data should be based upon the equipment required to provide the service, or alternatively allocated on the basis of floor area and sub-metering, split by registration, pre-assessment and treatment in a specific type of ward and other activities.
- Food, linen and facilities for hospitality services: the type and quantity of food provided to the patient, and the type, quantity and lifetime of bed linen and facilities data such as electricity, water and waste from provision of food or laundry services.
- Consumables and equipment for administrative services: the type, quantity, lifetime and number of uses of equipment and type and quantity of consumables associated with the administrative services required to operate a specific type of ward and the hospital services allocated to the inpatient bed day.
- Administrative services facilities: quantity of electricity, fuels, water and types of waste generated associated with the administrative services required to operate a specific type of ward and the hospital services allocated to the inpatient bed day.
- Staff and visitor travel: staff and visitor surveys to calculate the modes and distances travelled by staff and visitors attributable to operating a specific type of ward and hospital services.

These data are the minimum required to conduct an inpatient bed day appraisal. Additional activities, services and resources may be identified when mapping the specific inpatient bed day and these shall be included, noting that they are in addition to the minimum requirements set out in this guidance.

In some instances, it may not be possible practicably to attribute consumables, equipment or facilities data directly to the inpatient bed day. In these instances, they should be allocated to the stay using the collected reference data (eg number of staff, floor area, bed days, and patient throughput). Allocation is described further in *Section 1.6*.

If the 'bottom up' data described above are not available, then financial data and cost allocation may be used as a proxy in order to quantify consumables, equipment, facilities and travel data associated with an inpatient bed day.

1.4.2 Secondary Data

For activities identified in the process map that are outside the direct control of the organisation, suitable secondary data sources can be used. Secondary data are particularly useful to use where activities or modules are not deemed material to the study through a screening exercise or materiality assessment. Primary data collection is still preferred and should be used if it is reasonably possible to collect it.

Inpatient Visitor Statistics
http://www.erpho.org.uk/viewResource.aspx?id=22328

A study has been conducted by ERPHO and the SDU in the UK to identify the travel associated with inpatient attendance. On average, there is one return journey per 24hr bed day for a person to visit the patient.

In the absence of primary activity data, this information may be used. However, distances and modes of transport should still be collected.

General secondary data sources can be found in the *Section 1.7* and on the GHG protocol website [(1)].

1.5 EMISSION FACTORS

Once primary activity data or secondary activity data have been collected, they shall be combined with the appropriate emission factors to calculate the performance of the module against the sustainability metrics.

A default list of emission factors is available in *Annex C* of the Main Document and should be used where specific emission factors are not available. An example of a specific emission factor is the GHG emissions associated with the manufacture of a specific type of surgical mask.

If 'bottom up' activity data cannot be collected (eg quantities of types of consumables) then financial data may be used and combined with environmental extended input output (EEIO) analysis databases in order to calculate values for the sustainability metrics. Use of EEIO is considered to convey greater uncertainty and so using emission factors and primary activity data is preferable.

1.6 MODULE CALCULATION STEPS

Steps to appraise the module include the following.

1. Map the activities and services associated with the module.
2. Complete a materiality assessment using the module case study in order to understand the significance of the activity data and the module to the pathway (if relevant).
3. If significant, identify sources from which to collect the required activity data. If not significant, use appropriate secondary or case study data and adapt to the specific scenario.

(1) GHG Protocol Third Party Databases, http://www.ghgprotocol.org/Third-Party-Databases

4. Collect the required activity data relevant to the module scenario.
5. Identify how activity data can be allocated to the unit of analysis (see Allocation section below).
6. Identify secondary data sources either in *Annex C* of the Main Document or specific to the activity data collected.
7. Perform allocation where necessary and combine the activity data and emission factors.
8. Interpret the findings and follow the guidelines in *Section 3* of the main document for reporting.

Typically, the admission letter, pre-assessment and registration will be included only once for an inpatient bed day appraisal. For a specific care pathway, a succession of ward types may be used and either an average inpatient bed day or a combination of inpatient bed days will be required. Each type of ward the patient requires for the specific care pathway will need to be appraised separately for each 24hr period.

For the appraisal of a care pathway, each ward inpatient bed day or the average inpatient bed day will then be multiplied by the length of the stay in days, or by the number of days on each ward type and added to the admission letter, pre-assessment and registration in order to calculate the total inpatient bed day.

1.6.1 Allocation

In the first instance, one should seek to avoid allocation. However, this is often impracticable. Activity data collected for the module may need to be allocated to the particular module and to the unit of analysis. This is described below in order of priority.

- Consumables and equipment used in a specific ward.
    - i. Collect activity data specific to the unit of analysis in the first instance.
    - ii. Identify consumables and equipment used during a hospital stay, including those associated allied health professional care, eg physiotherapists, occupational therapists, dieticians, and those specific to the condition and divide by the number of patients staying for the specific condition and the number of bed days in that ward type.
    - iii. If this is not possible, collect activity data on consumables and equipment used in all wards at hospital and divide by the total throughput of all patients having stayed overnight in a ward for the defined time period.

- Consumables and equipment used during registration, pre-assessment.
    - i. Collect activity data specific to the unit of analysis in the first instance.
    - ii. Where possible, identify consumables and equipment used throughout registration and pre-assessment in the hospital that are directly attributable to the visit separately.
    - iii. Identify all consumables and equipment used by services required to provide an inpatient bed day and allocate across total patient bed days.

- Facilities and shared services data for the inpatient bed day.

i. Where possible, identify the facilities data (eg electricity) directly attributable to the inpatient with a specific condition (eg by considering equipment use).
ii. Identify facilities data by activity (eg registration, pre-assessment, treatment at ward/ICU) for the inpatient bed day and use a technical expert (or use cost allocation processes) to estimate the proportion to be allocated to the inpatient. Divide the resulting data by the total number of bed days in specific ward types.
iii. Identify facilities data for the relevant department. Identify the floor space of the relevant rooms in the hospital and allocate on this basis, before dividing by the total number of bed days.

- Food and linen used for hospitality services.
  i. Where possible, identify the food and linen used that are directly attributable to the inpatient unit of analysis.
  ii. Identify food and linen used for a specific ward type and divide by the number of bed days for that ward. Identify the number of uses of linen and attribute linen per bed day.
  iii. Identify all consumables and equipment used by services required to provide a bed day and allocate across total inpatient throughput of the hospital over the defined time period.

- Facilities data for hospitality services.
  i. Where possible, attribute hospitality facilities data such as catering and laundry services directly to inpatients.
  ii. Identify total facilities data for the catering and laundry services and allocate to total number of bed days for the hospital.

- Consumables and equipment used for shared hospital services and inpatient administrative services.
  i. Where possible, identify consumables and equipment used throughout the shared services that are directly attributable to inpatients.
  ii. Identify all consumables and equipment used by services required to provide a bed day and allocate across total inpatient bed days for the hospital over the defined time period.

- Facilities data for shared hospital services and inpatient administrative services.
  i. Where possible, attribute shared facilities data directly to the inpatient.
  ii. Identify total facilities data for the hospital and allocate to total inpatient bed days for the hospital.

1.7 EXAMPLE CALCULATIONS

An example of calculating GHG emissions, fresh water use and waste generated for the module is shown below. Results are provided per bed day for two types of inpatient admissions:

- Low-intensity inpatient bed day; and
- High-intensity inpatient bed day.

The materiality of data should be considered when collecting and appraising data for the module. Materiality refers to the estimated significance of data to the module being appraised. It is recommended that no more than 10% of data contributing any impact appraised be excluded (eg 10% contribution to GHG emissions of the module). Further guidance on estimating significance can be found in the main document and annexes [1]. Users may apply a different cut-off percentage (other than 10%) if justified and this shall be reported along with the results of the appraisal.

For a GHG appraisal, additional effort should be taken when appraising the following categories as these are anticipated to be the most significant contributors:

- consumables (eg single use medical devices used);
- energy (eg electricity used directly by the module); and
- travel (eg of patients to, from and within the module).

Other hotspots may be identified when conducting an appraisal and all resources and emissions within the boundaries of the module should be considered for significance before excluding any data point.

(1) Refer to section 2.6.3 Materiality and Data Screening in the Care Pathways: Guidance on Appraising Sustainability: Main Document

Module Inpatient – low-intensity ward

Unit of analysis An average bed day (24 hour period over which a patient stays overnight at a hospital in a low-intensity ward for treatment and monitoring)

Included activities

- ✓ Consumables used in the wards
- ✓ Electricity, fuel and water use in the wards
- ✓ Electricity, fuel and water used in shared services
- ✓ Food consumption by patient
- ✓ Linen use and cleaning and facilities cleaning
- ✓ Staff and visitor travel
- ✓ Waste generated
- ✓ Sterilisation
- ✓ Administration activities

Excluded activities

- × Pharmaceuticals administered during patient treatment (due to lack of data)
- × Capital goods (eg buildings, car parks)
- × Staff training
- × Health authorities, financial services

Assumptions Hospital energy consumption was allocated based on staff numbers. Consumables data was provided for a single month (April 2015) and was considered a reasonable approximation for monthly consumption in 2013/14. The number of low-intensity bed days was calculated based on monthly midnight occupancy data.

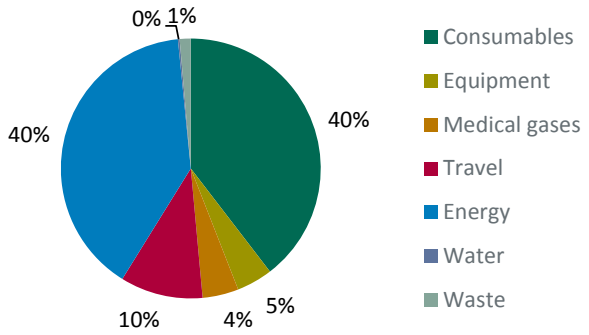
Data sources

- Richard Hales, Head of Energy and Sustainability, Addenbrooke's Hospital Trust and Site: Addenbrooke's Hospital (AH), Cambridge University Hospitals NHS Foundation Trust
- Average distance travelled by purpose and main mode: England, 2013, National Travel Survey, Department for Transport statistics
- Estates Return Information Collection (ERIC) database maintained by the Health and Social Care Information Centre

Low-intensity inpatient bed day results (per day)

per day	GHG Emissions (kg CO_2e)	Fresh water use - direct (m^3)	Fresh water use - indirect (m^3)	Fresh water use - total (m^3)	Hazardous waste (kg)	Non-hazardous waste (kg)	Total waste (kg)
Consumables *(including food)*	15	x	13	13	x	x	x
Equipment	1.7	x	20	20	x	x	x
Medical gases	1.7	x	0.066	0.066	x	x	x
Travel	3.9	x	6.6	6.6	x	x	x
Energy	15	x	20	20	x	x	x
Water	0.083	0.24	0.8	1	x	x	x
Waste	0.52	x	0.18	0.18	1.2	2.2	3.3
Total	37.9	0.24	60.6	60.8	1.2	2.2	3.3

Contribution analysis GHG emissions



Module Inpatient – High-intensity ward

Unit of analysis An average bed day (24 hour period over which a patient stays overnight at a hospital in an high-intensity ward for treatment and monitoring)

Included activities

- ✓ Consumables used in the wards
- ✓ Electricity, fuel and water use in the wards
- ✓ Electricity, fuel and water used in shared services
- ✓ Linen use and cleaning and facilities cleaning
- ✓ Staff and visitor travel
- ✓ Waste generated
- ✓ Sterilisation
- ✓ Administration activities

Excluded activities

- × Pharmaceuticals administered during patient treatment (due to lack of data)
- × Capital goods (eg buildings, car parks)
- × Staff training
- × Health authorities, financial services

Assumptions Hospital energy consumption was allocated based on staff numbers. Consumables data was provided for a single month (April 2015) and was considered a reasonable approximation for monthly consumption in 2013/14. The number of high-intensity bed days provided was calculated based on monthly midnight occupancy data.

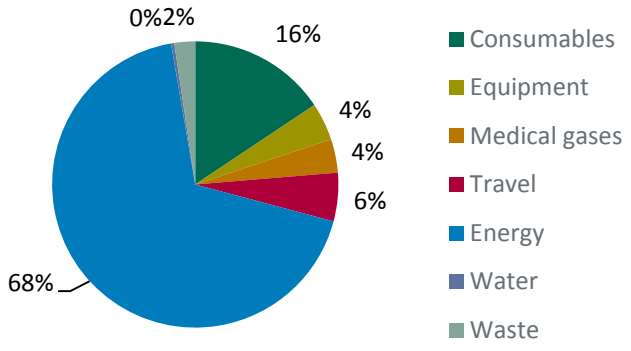
Data sources

- Richard Hales, Head of Energy and Sustainability, Addenbrooke's Hospital Trust and Site: Addenbrooke's Hospital (AH), Cambridge University Hospitals NHS Foundation Trust
- Average distance travelled by purpose and main mode: England, 2013, National Travel Survey, Department for Transport statistics
- Estates Return Information Collection (ERIC) database maintained by the Health and Social Care Information Centre

High-intensity inpatient bed day results (per day)

per day	GHG Emissions (kg CO_2e)	Fresh water use - direct (m^3)	Fresh water use - indirect (m^3)	Fresh water use - total (m^3)	Hazardous waste (kg)	Non-hazardous waste (kg)	Total waste (kg)
Consumables *(including food)*	14	x	5.3	5.3	x	x	x
Equipment	3.8	x	41	41	x	x	x
Medical gases	3.4	x	0.13	0.13	x	x	x
Travel	4.9	x	8.2	8.2	x	x	x
Energy	61	x	78	78	x	x	x
Water	0.33	0.96	3.2	4.1	x	x	x
Waste	2.1	x	0.73	0.73	4.6	8.6	13
Total	89.5	0.96	136.6	137.5	4.6	8.6	13

Contribution analysis GHG emissions



For further information or to provide feedback please visit:
www.sduhealth.org.uk/cspm

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